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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/678,354	10/02/2003	Deniz K. Armani	3203534002 / 703666-9001	1793

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EXAMINER	
UNELUS, ERNEST	
ART UNIT	**PAPER NUMBER**
2828	

DATE MAILED: 10/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.	**Applicant(s)**	
10/678,354	ARMANI ET AL.	
Examiner	**Art Unit**	
Ernest Unelus	2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 October 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23,28-62 and 67-77* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22,28-58,60-62 and 67-77* is/are rejected.

7)☒ Claim(s) *23 and 59* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date *04/06/05*, *12/07/04*, 03/04/04

4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

Claims 23 and 59 are objected to because of the following informalities: the word "biotinlynated" is not correctly spelled. The office is assuming the word to be "biotinylated". Appropriate correction is required.

Claim 53 is objected to because of the following informalities: it depends from itself. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Regarding claims 11 and 44, the phrase " at least about " renders the claim indefinite. There is no indication as to what range is covered by the term "at least about". See MPEP § 2173.05(d).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 4-8, 13, 15, 22, 29, 30, 34, 36-41, 45, 47, 49, and 62, are rejected under 35 U.S.C 102(b) as being anticipated by McCall (5,343,490).

With respect to claims 1, 2, and 8, McCall discloses a micro-cavity resonator (70) being substantially parallel to a top surface of the pillar, comprising: a micro-cavity; a substrate portion (73) of the substrate located below the micro-cavity being removed to form a pillar (73), the pillar supporting the ultra-high Q micro-cavity, whereby optical energy travels along an inner surface of the micro-cavity (col. 7, lines 18-50) see figure 7.

With respect to claims 4 and 36, McCall discloses the micro-cavity being substantially circular and having a diameter of about 10 micrometers (col. 7, line 38).

With respect to claims 5, 6, and 38, McCall discloses a toroid-shaped micro-cavity having a thickness of four micrometers (col. 8, line 39) see figure 4.

With respect to claims 7 and 39, McCall teaches that the micro-cavity having an elliptical shape (col. 9, line 64).

With respect to claims 13, and 45, McCall discloses a resonant mode within the micro-cavity comprising a whispering-gallery mode (WGM) (col. 6, line 30).

With respect to claim 15, McCall discloses an etchant, the substrate underneath the micro-cavity being removed by the etchant (col. 7, lines 35-36).

With respect to claim 22, McCall discloses an optically active component within the micro-cavity (col. 5, lines 1-3).

With respect to claims 29, 34, and 37, McCall discloses a high Q micro-cavity resonator, comprising: a toroid shape an optical material; and a substrate that supports the optical material wherein optical energy travels along an inner surface of the high Q micro-cavity (col. 7, lines 27-68) see figure 7. Limitations in claim 29 are presented as a process of making the micro cavity. This is a product by process and it is the patentability of the product and not the process which must be obtained. (MPEP 2113)

With respect to claim 30, McCall discloses an optical material comprising silica (col. 6, line 68).

With respect to claim 40, McCall discloses an ultra-high Q micro-cavity being Substantially parallel to a top surface of the pillar (see figure 7).

With respect to claim 41, McCall discloses a micro cavity wherein a size of the ultra-high Q micro-cavity is limited by a size of a top surface of the substrate (see figure 7).

With respect to claim 47, McCall discloses a micro cavity wherein portions of the substrate located below the ultra-high Q micro-cavity are removed to form a pillar, the pillar supporting the ultra-high Q micro-cavity (col. 7, lines 27-68) see figure 7.

With respect to claim 49, McCall discloses an etchant, where the substrate underneath the periphery of the ultra-high Q micro-cavity being removed by the etchant (col. 7, lines 27-68).

With respect to claim 62, McCall discloses a micro cavity comprising an optically active component within the ultra-high Q micro-cavity (col. 7, lines 27-68).

Claims 68-69, and 71 are rejected under 35 U.S.C. 102(b) as being anticipated by Chu: "Observation Of Enhanced Photoluminescence In Erbium-Doped Semiconductor Microdisck Resonator"

With respect to claims 68 and 69, Chu discloses a method of forming a micro-cavity, comprising: providing a substrate and an optical material; coating the substrate with silicon dioxide; etching the substrate to form a pillar, the pillar supporting the optical material; and heating a periphery of the optical material so that the periphery melts and adheres to itself to form the micro-cavity, whereby optical energy travels along an inner surface of the micro-cavity (pages 2843-2844).

With respect to claim 71, Chu discloses an optical material further comprising silica (page 2843).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 3, 12, 14, 28, 31, 35, 46, and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over McCall (5,343,490) in view of Kawachi: "Silica Waveguides On Silicon And Their Application To Integrated–Optic Components"

With respect to claim 3, McCall discloses a micro-cavity with the exception of specifically disclosing whether it comprising an ultra-high Q silica micro-cavity. However, a micro-cavity comprising an ultra-high Q silica micro-cavity is well known as taught by Kawachi. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the micro-cavity of McCall with an ultra-high Q silica micro cavity of Kawachi to produce a low-loss channel (Kawachi, page 391).

In regards to claims 12, 14, 28, 31, 35, 46, and 58, McCall disclose everything claimed as applied above with the exception of the micro-cavity comprising a glass material having a melting point that is lower than a melting point of the substrate, the resonator of the micro-cavity comprising a silica ultra-high Q micro-cavity, and the substrate comprising a silicon substrate. However, Kawachi teaches the micro-cavity comprising a glass material having a melting point that is lower than a melting point of the substrate, the resonator of the micro-cavity comprising a silica ultra-high Q micro-cavity, and the substrate comprising a silicon substrate (page 393). It would have been obvious to one of ordinary skill in the art at the time the invention was made to include everything above to improve the refractive index difference between the cores and the buffer (Kawachi, pages 391 and 393).

Claims 16-18, and 50-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over McCall (5,343,490) in view of Chan: "Gas Phase Pulse Etching of Silicon For MEMS With Xenon Difluoride"

With respect to claims 16-17 and 50-51, McCall disclose the micro cavity resonator having an etchant comprising a gas with the exception to specifically indicate the etchant comprising a xenon difluoride gas. However, the etchant comprising a xenon difluoride gas is well known in the art as taught by Chan (page 1637). It would have been obvious to one of ordinary skill in the art at the time the invention was made to include an etchant with xenon difluoride to provide unique properties such as isotropic etching, high selectivity, and gentle dry reactions.

With respect to claim 18, McCall disclose a micro cavity resonator with the exception of specifically indicating the substrate comprising a silicon substrate. However, the substrate comprising a silicon substrate is well know in the art as taught by Chan (page 1637). It would have been obvious to one of ordinary skill in the art at the time the invention was made to include silicon in the substrate to help release microelectromechanical systems devices.

Claims 19 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over

McCall (5,343,490) in view of Gayral: "High-Q Wet-etched GaAs Microdisks Containing InAs Quantum Boxes"

In regards to claims 19, and 48, McCall disclose everything claimed as applied above with the exception of the substrate having a tapered shape. However, the substrate having a tapered shape has been thaught by Gayral (page 1908]). It would have been obvious to one of ordinary skill in the art at the time the invention was made to include the tapered shape for their promise for realizing low threshold light emitting or lasing devices, which will also prevent oxidation.

Claims 20, 21, 60, and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over McCall (5,343,490) in view of Chu: "Observation Of Enhanced Photoluminescence In Erbium-Doped Semiconductor Microdisck Resonator"

In regards to claims 20, 21, 60, and 61, McCall disclose everything claimed as applied above with the exception of the micro-cavity including the rare earth dopant. However, the micro-cavity including the rare earth dopant has been taught by Chu (page 2843). It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a rare earth dopant to receive strong emission.

Claims 9-11, 32, 33, 42-44, and 52-57 are rejected under 35 U.S.C. 103(a) as being unpatentable

over McCall (5,343,490) in view of Klitzing: "Tunable Whispering Gallery Modes For Spectroscopy and CQED experiments"

In regards to claims 9-11, and 42-44, McCall disclose everything claimed as applied above with the exception of specifically indicating the Q factor or the Q value. However, Klitzing discloses a Q factor of 3x10^9 at 780nm (page 14.4). It would have been obvious to one of ordinary skill in the art at the time the invention was made to maximize the Q factor to include amplitude change for a particular wavelength being cavitated, as well as to shift wavelength either regarding detection or output.

In regards to claims 32, 33, 52, and 53, McCall disclose everything claimed as applied above with the exception of specifically indicating the diameter of the disk becoming smaller when heated using an Excimer laser. However Klitzing discloses an optical material comprising a disk, wherein a diameter of the disk becomes smaller when heated using an Excimer laser (page 14.8). It would have been obvious to one of ordinary skill in the art at the time the invention was made to minimize the diameter of the disk with heat using an Excimer laser to create a strong vertical gradient in the intensity of the infrared radiation.

In regards to claims 54-57, McCall disclose everything claimed as
applied above with the exception of the optical material comprising a CO2 laser that
emits radiation having a wavelength of about 10.6 micrometers, heats the optical
material for about 1 microsecond to about 10 seconds, and liquefies the
optical material. However, the optical material comprising a CO2 laser that
emits radiation having a wavelength of about 10.6 micrometers, heats the optical
material for about 1 microsecond to about 10 seconds, and liquefies the
optical material is well taught by Klitzing (page 14.7, 14.8, and 14.11). It would have

been obvious to one of ordinary skill in the art at the time the invention was made to preserve the symmetry of revolution of the microsphere and stems.

Claim 70 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chu: "Observation Of Enhanced Photoluminescence In Erbium-Doped Semiconductor Microdisck Resonator" in view of Chan: "Gas Phase Pulse Etching of Silicon For MEMS With Xenon Difluoride"

With respect to claim 70, Chu disclose the micro cavity Resonator having an etchant comprising a gas with the exception to specifically indicate the etchant comprising a xenon difluoride gas. However, the etchant comprising a xenon difluoride gas is well known in the art as taught by Chan (page 1637). It would have been obvious to one of ordinary skill in the art at the time the invention was made to include an etchant with xenon difluoride receive unique properties such as isotropic etching, high selectivity, and gentle dry reactions.

Claims 72-77 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu: "Observation Of Enhanced Photoluminescence In Erbium-Doped Semiconductor Microdisck Resonator" in view of Klitzing: "Tunable Whispering Gallery Modes For Spectroscopy and CQED experiments"

With respect to claims 72-77, Chu discloses a micro-cavity resonator without specifically indicating the periphery of the optical material further comprises liquefying the optical material with an Excimer and a CO2 laser. However, the periphery of the optical material further comprises liquefying the optical material with an Excimer and a

CO2 laser (page 14.8). It would have been obvious to one of ordinary skill in the art at the time the invention was include to include a CO2 and an Excimer laser to ease the production of tunable silica microspheres for its easiness to control.

Claim 67 is rejected under 35 U.S.C. 103(a) as being unpatentable over McCall (5,343,490).

With respect to claim 67, McCall discloses everything claimed above and the micro-cavity being anisotropically etched to form a silicon pillar. McCall fails to specifically discloses that the micro cavity can also be isotropically etched to form the silicon pillar. However, isotropic or anisotropic etching can be employed to produce selected curvature and slant of cavity sidewalls formed in a silicon layer or membrane. It would have been obvious to one of ordinary skill in the art at the time the invention was to use either isotropic or anisotropic to etched the micro cavity to enable the formation of asperities or other distinct features to be located at the limiting aperture.

Claim Objections

Claims 23 and 59 would be allowable if rewritten to overcome the objection, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Claims 23 and 59 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the prior art of record, taken alone or in combination, fails to disclose or render obvious, the micro cavity having a “biotinlynated” surface.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1, 2, 3, 4, 5, 6, 8, 10, 13, 14, 19, 21, and 32 provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 24, 29, 31, 45, 34, 35, 36, 30, 38, 39, 41, 3, and 42 of copending application number 11/016,067. Although the conflicting claims are not identical, they are not patentably distinct from each other because the disclose similar limitations;

Regarding claim 1, application No 11,016,067 provides a micro-cavity; and a substrate, portions of the substrate located below the micro-cavity being removed to form a pillar, the pillar supporting the ultra-high Q micro-cavity, whereby optical energy travels along an inner surface of the micro-cavity (see claim 24). Regarding claim 2, application number 11,016,067 provides a micro-cavity comprising an ultra-high Q planar micro-cavity (see claim 24). Regarding claim 3, application number 11,016,067 provides a micro-cavity comprising an ultra-high Q silica micro-cavity (see claim 4). Regarding claim 4, application number 11,016,067 provides a micro-cavity being substantially circular and having a diameter of about 10 micrometers to about 500 micrometers (see claim 45). Regarding claims 5 and 6, application number 11,016,067 provides a micro-cavity having a toroid shape thickness of about five to about ten micrometers (see claims 34 and 35). Regarding claim 8, application number 11,016,067 provides a micro-cavity being substantially parallel to a top surface of the pillar (see claim 36). Regarding claim 10, application number 11,016,067 provides a micro-cavity having a Q value of about 10^8 to about 5 x 10^8 (see claim 30). Regarding claim 13, application number 11,016,067 provides a micro-cavity comprising a whispering-gallery mode (WGM) (see claim 38). Regarding claim 14, application number 11,016,067 provides a micro cavity where the substrate comprising a silicon substrate (see claim 39). Regarding claim 19, application number 11,016,067 provides a micro cavity where the pillar having a tapered shape (see claim 41). Regarding claim 21, application number 11,016,067 provides a micro cavity with a rare Earth dopant being erbium, ytterbium, or neodymium (see claim 3). Regarding claim 32, application number 11,016,067 provides a micro cavity wherein a diameter of the disk becomes smaller when heated (see claim 42).

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Tayebati et al. (US Pat. 6,438,149) discloses a microelectromechanically tunable, confocal, vertical cavity surface emitting laser and fabry-perot filter and Boyd: "Sensitive disk Resonator Photonic Biosensor.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ernest Unelus whose telephone number is 571-272-0218. The examiner can normally be reached on 9:00am to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on 571-272-1835. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

E.U

ZANDRA V. SMITH
PRIMARY EXAMINER